

WATER RESOURCES DEVELOPMENT PROJECT

**SAXONVILLE  
LOCAL PROTECTION**

*Design*  
**SUDBURY RIVER  
MERRIMACK RIVER BASIN**

FRAMINGHAM, MASSACHUSETTS

**DESIGN MEMORANDUM NO. 3**

**CONCRETE MATERIALS**



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
WALTHAM, MASS.

**MARCH 1975**



DEPARTMENT OF THE ARMY  
NEW ENGLAND DIVISION, CORPS OF ENGINEERS  
424 TRAPELO ROAD  
WALTHAM, MASSACHUSETTS 02154

REPLY TO  
ATTENTION OF:

NEDED-E

10 March 1975

SUBJECT: Saxonville Local Protection Project, Sudbury River,  
Merrimack River Basin, Framingham, Massachusetts,  
Design Memorandum No. 3, Concrete Materials

HQDA (DAEN-CWE-B)  
WASH DC 20314

In accordance with ER 1110-2-1150, there is submitted for review  
and approval DM No. 3, Concrete Materials, for the Saxonville  
Local Protection Project.

FOR THE DIVISION ENGINEER:

Incl (10 cys)  
as

*George J. Sarandis*  
for JOHN Wm. LESLIE  
Chief, Engineering Division

WATER RESOURCES DEVELOPMENT PROJECT  
 SAXONVILLE LOCAL PROTECTION  
 SUDBURY RIVER, MERRIMACK RIVER BASIN  
 FRAMINGHAM, MASSACHUSETTS  
DESIGN MEMORANDA INDEX

<u>No.</u>	<u>Title</u>	<u>Anticipated Submission Date</u>	<u>Date Submitted</u>	<u>Date Approved</u>
1	Hydrologic Analysis		12 Dec 72	23 Feb 73
2	General Design - Phase I - Plan Formulation		30 Apr 73	27 Aug 73
2	General Design - Phase II		26 Jul 74	5 Sep 74
3	Concrete Materials		10 Mar 75	
4	Embankments and Foundations		23 Jan 75	21 Feb 75
5	Design of Structures		19 Sep 74	30 Oct 74

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FRAMINGHAM, MASSACHUSETTS

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SAXONVILLE LOCAL PROTECTION

FRAMINGHAM, MASSACHUSETTS

DESIGN MEMORANDUM NO. 3

CONCRETE MATERIALS

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SAXONVILLE LOCAL PROTECTION

FRAMINGHAM, MASSACHUSETTS

DESIGN MEMORANDUM NO. 3

CONCRETE MATERIALS

1. General. The project, located in the city of Framingham, Massachusetts, will require approximately 4,500 cubic yards of concrete for construction of an intake structure, structural flood walls, pumping station and a vehicular gate. The concrete will be subjected to severe climatic conditions with alternate cycles of freezing and thawing during the winter months; therefore, air-entrained concrete is considered mandatory to provide the required durability of the structures. The structures which will be subjected to low velocity flows of water will require only regular quality structural concrete. Considering the small quantity of concrete required, the specifications will provide for use of a manual control concrete plant located off site with a capacity of 40 cubic yards per hour, with the concrete mixed by stationary, truck or paving mixers. No special requirements for concrete are anticipated. Some architectural treatment of concrete will be required. It will be accomplished mainly by use of textured form liners and feature strips. A more detailed discussion is presented under the Architectural Design section of Design Memorandum No. 5.

2. Cementing Materials. The size of the monoliths will not result in excessive thermal stresses nor does the location of the structure involve sulfate exposure; therefore, the use of Type I portland cement will satisfy the requirements for this project. It is not considered economically feasible to use pozzolan or special cements for this project because of the small quantity of concrete required. No special investigations of portland cements have been conducted, as cement used in this area is usually supplied by one of eight cement mills located in the Pennsylvania Lehigh Valley, or seven cement mills located in the New York Hudson River Valley, or the one mill located in Thomaston, Maine. Some of the mills do not manufacture Type I portland cement but do manufacture Type II, therefore, Type I or II portland cement will be specified.

### 3. Aggregate.

a. Field Investigation. A field reconnaissance was performed in September and November, 1974 by an engineer geologist team to determine the available sources of concrete aggregates. Due to the quantity of concrete required and location of the project site, there is a high probability that concrete will be obtained through a ready-mix concrete supplier; therefore, the available source investigation includes not only the potential aggregate sources in the project area but also those which normally supply the ready mix companies in the project area. There are seven commercial sources of processed sand and gravel within a 16 mile radius of the project site. Table I lists the sources, location of processing plant, plant capacity and haul distance to the Framingham project site as well as the type of geologic deposit representative of the pit from which the materials are obtained.



TABLE I

<u>SOURCE AND PLANT LOCATION</u>	<u>TYPE GEOLOGIC DEPOSIT</u>	<u>PLANT CAPACITY (tons per hour)</u>	<u>HAUL DISTANCE (miles)</u>
New England Sand & Gravel Co. Framingham, Mass.	Glacial kame terrace and outwash plain	200	1/2
Ashland Sand & Concrete Co. Ashland, Mass.	Glacial kame terrace	150	7
Melone & Sons Sand & Gravel Stow, Mass.	Glacial kame terrace	100	9½
Lexington Sand & Gravel Acton, Mass.	Glacial outwash plain	300	10
Tresca Brothers, Sand & Gravel, Inc. Millis, Mass.	Glacial kame terrace	175	12
Varney Brothers, Sand & Gravel, Inc. Bellingham, Mass.	Glacial outwash plain	200	24
Rosenfeld Sand & Stone Co. South Hopedale, Mass.	Glacial kame terrace	300	27

The locations of the project site and the commercial sources of aggregate are shown on Plate 3-1.

New England Sand and Gravel Company operate a sand and gravel processing plant in Saxonville, one half mile from the project site. Materials are obtained from their pit located in Hopkinton, Massachusetts, located thirteen miles from the project site. Fine and coarse aggregate are used at their concrete plant located in Framingham, two miles from the project site. Ashland Sand and Concrete Company operate a sand and gravel processing plant seven miles from the project site. Aggregates are obtained from pits in Bellingham, Massachusetts located twenty-eight miles from the project site, and owned by their affiliate Rosenfeld Concrete Company Incorporated. Ashland fine and coarse aggregates are used in concrete by Rosenfeld Concrete Company Incorporated whose plant is also located in Ashland seven miles from the project site.

Melone and Sons Sand and Gravel operate a sand and gravel processing plant at their pit in Stow Massachusetts, a nine and one half mile haul distance from the project site. Melone supplies fine and coarse aggregate for concrete to J.H. McNamara, Incorporated and Riverside Concrete Company, both located in Waltham, Massachusetts. Neither of these concrete suppliers indicated interest in supplying concrete into the project area. Lexington Sand and Gravel operate a sand and gravel processing plant at their pit in Acton, Massachusetts, a ten mile haul distance to the project site. They also operate another pit located in Pepperill, Massachusetts. Lexington occasionally supplies fine and coarse aggregate to the above mentioned Riverside Concrete Company. Tresca Brothers Sand and Gravel Incorporated, operate a processing plant and concrete plant at their pit location in Millis, Massachusetts, twelve miles from the project site. Varney Brothers Sand and Gravel Incorporated operate a sand and gravel processing plant and a concrete plant at their pit in Bellingham, Massachusetts, a twenty four mile haul distance from the project site. They have additional pits in Bellingham, and also in Medfield, Massachusetts. Rosenfeld Sand and Stone Company operate a sand and gravel processing plant in South Hopedale, Massachusetts, a twenty-seven mile haul distance from the project site and a concrete plant in Milford, Mass., a twenty-four mile haul distance to the project site. Fine and coarse aggregates are obtained mainly from their pit locations in Bellingham, Massachusetts, a twenty-eight mile haul distance from the project site. Rosenfeld Sand and Stone Company and Varney Brothers Sand and Gravel Incorporated are both considered as potential sources and have been tested previously with current samples indicating that the materials are now identical to those previously tested. Both sources are reported in Technical Memorandum No. 6-370, "Test Data - Concrete Aggregates in Continental United States" Volume 5. Varney is listed under Latitude 42° N, 71° W, Index No. 14. Rosenfeld is listed under Latitude 42° N, Longitude 71° W, Index No. 15 (Rev.).

Due to the quantity of concrete required for this project and since Melone & Sons Sand and Gravel, and Lexington Sand and Gravel only supply fine and coarse concrete aggregates to concrete producers who have indicated no interest in supplying the project area, they are not considered as potential sources for this project.

New England Sand & Gravel Company, Ashland Sand and Concrete Company, and Tresca Brothers Sand and Gravel Incorporated produce fine and coarse aggregate used by concrete suppliers located within a ten mile radius of the subject project and are considered as potential competitive sources. The maximum size coarse aggregate

normally commercially available in the project area is  $1\frac{1}{2}$  inches which is manufactured to meet State of Massachusetts specifications. Because of the increased costs of production for a larger size and relatively small quantity of concrete required a  $1\frac{1}{2}$  inch maximum size aggregate conforming to State of Massachusetts specification requirements will be specified. Normal local practice in the area is to use a blend of three size groups of aggregates to produce a  $1\frac{1}{2}$  inch MSA and two to produce  $3/4$  inch MSA. This practice will be allowed on this project.

b. Sources and Estimated Prices. - The sources of potential aggregate and the estimated delivered prices to the project site of these aggregates, based on the quoted plant prices and Massachusetts Department of Public Utilities minimum trucking rates, which are currently twenty-five cents per ton for the first mile and five cents per ton for each additional mile are as follows:

(1) New England Sand & Gravel Company. Quoted plant prices are \$3.00 to \$3.25 per ton for gravel, depending on the size group and \$2.50 per ton for concrete sand. The delivered prices to the site will average \$3.37 per ton for gravel and \$2.75 per ton for concrete sand.

(2) Ashland Sand & Gravel Company. Quoted plant prices are \$3.00 to \$3.25 per ton for gravel, depending on the size group and \$2.15 per ton for concrete sand. The delivered prices to the site will average \$3.67 per ton for gravel and \$2.70 per ton for concrete sand.

(3) Tresca Brothers Sand & Gravel Incorporated. Quoted plant prices are \$2.50 to \$3.25 per ton for gravel, depending on the size group and \$2.10 per ton for concrete sand. The delivered prices to the site will average \$3.67 per ton for gravel and \$2.90 per ton for concrete sand.

(4) Varney Brothers, Sand & Gravel Incorporated. Quoted plant prices are \$3.50 per ton for gravel and \$2.50 per ton for concrete sand. The delivered prices to the site will average \$5.05 per ton for gravel and \$4.05 per ton for concrete sand.

(5) Rosenfeld Sand and Stone Company. Quoted plant prices are \$2.90 to \$3.15 per ton for gravel, depending on the size group and \$2.25 per ton for concrete sand. The delivered prices to the site will average \$4.40 per ton for gravel and \$3.65 per ton for concrete sand.

c. Aggregate Tests. Results of aggregate tests performed on materials from New England Sand and Gravel Company are summarized on Plate Number 3-2.

A petrographic examination of coarse and fine aggregate from Rosenfeld Sand and Stone Company and Varney Brothers Sand and Gravel Incorporated indicated that the materials are now identical to those previously tested. Results of aggregate tests for these two previously tested sources are summarized respectively on Plate Numbers 3-4 and 3-5. Although complete physical testing of Tresca Brothers Sand and Gravel Incorporated was not performed, a petrographic examination showed it to be composed mainly of the same rock types as the more completely tested New England Sand and Gravel Company source, but only having varying proportions. Similarly the particles are clean, sound, adequately shaped, with no significant amounts of deleterious materials. Overall it has greater percentages of flat and elongated, and weathered particles but not in objectionable amounts. Based on these findings and available test results from state and commercial laboratories, plus a satisfactory service record to date Tresca Brothers Sand and Gravel Incorporated is considered as an acceptable source of concrete aggregates.

d. Concrete Making Properties of Aggregates. The water cement ratio and cement factor versus compressive strength curves developed by utilizing concrete aggregates for New England Sand and Gravel Company are shown on Plate Number 3-3.

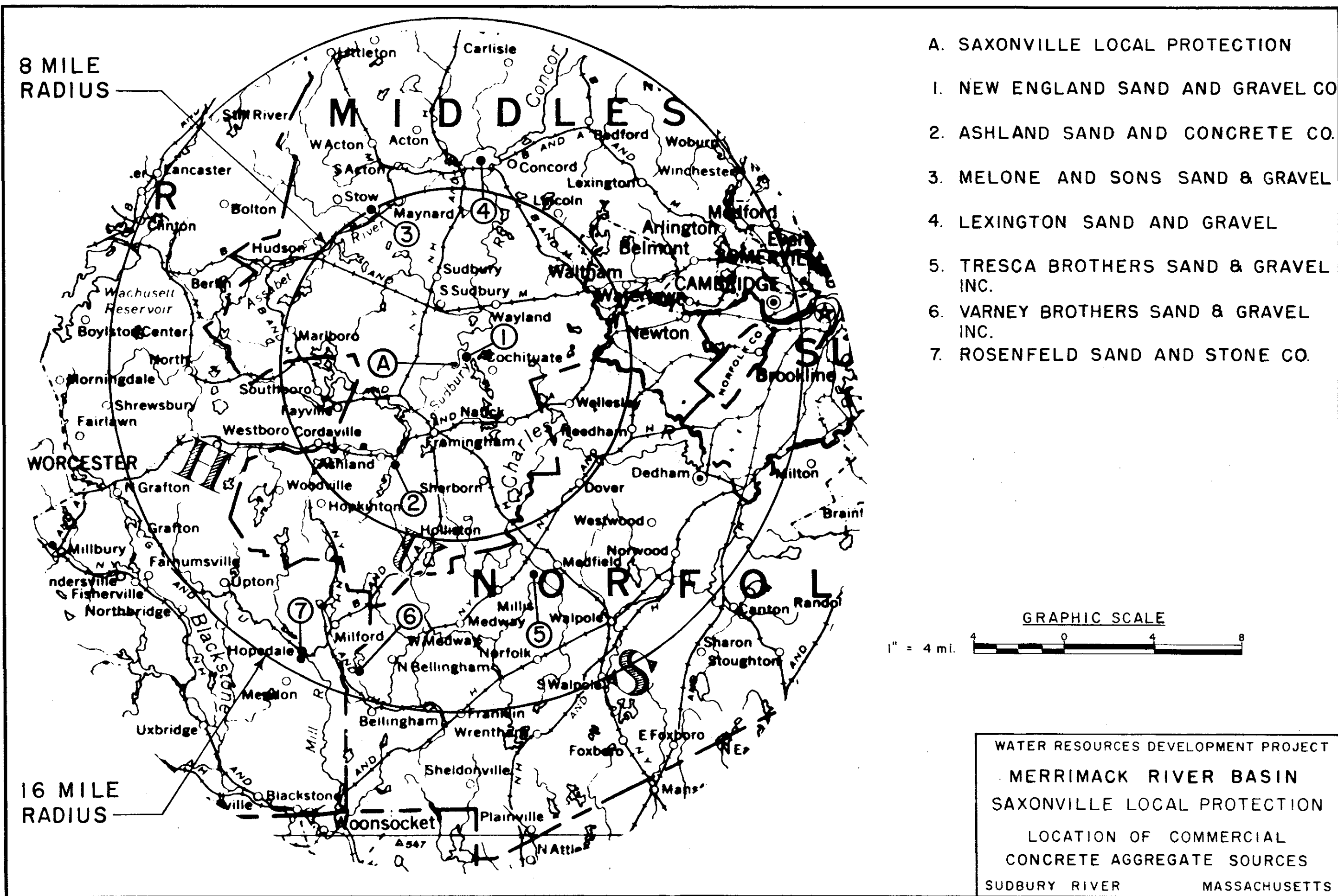
e. Service Records. The aggregates from the four potential sources have been used in concrete for various federal, state and local projects, mainly state and federal highway bridges, local commercial buildings and shopping centers, city schools and state colleges. The performance of aggregates from all of the sources is considered satisfactory, although it must be noted the period of record is less than fifteen years.

4. Water. Samples of water have been obtained from the Saxonville Pond. Sample was acceptable as mixing water when tested in accordance with CRD-D-406-66. Sample exhibited severe staining when tested in accordance with CRD-C-401-57. Sources of water proposed by the contractor for mixing and curing concrete will be tested prior to use.

5. Sources of Concrete. There are five interested sources of ready-mixed concrete within a 16 mile radius of the project site. New England Sand and Gravel Company operate an automatic transit mix-type concrete plant in Framingham, Massachusetts approximately two miles haul distance from the project site. Rosenfeld Concrete Company, Incorporated operate a manual transit mix type plant in

Ashland, Massachusetts approximately seven miles haul distance from the project site. Tresca Brothers, Sand and Gravel, Incorporated operate an automatic transit mix-type concrete plant in Millis, Massachusetts approximately a twelve mile haul distance from the project site. Rosenfeld Concrete Company, Incorporated also operates manual and automatic transit mix-type concrete plants in Milford, Massachusetts, approximately twenty-four mile haul distance from the project site. Varney Brothers Sand and Gravel Incorporated operate a semi-automatic transit mix-type concrete plant in Bellingham, Massachusetts approximately twenty-four mile haul distance from the project site. All of the above concrete plants are capable of production rates well above those required for this project.

6. Recommendations and Conclusions. Based on the data presented herein it is considered that aggregate from the two previously tested sources, Rosenfeld Sand and Stone Company and Varney Brothers Sand and Gravel Incorporated, as well as Ashland Sand and Concrete Company who process aggregates obtained from Rosenfeld, and the two newly tested sources New England Sand and Gravel Company and Tresca Brothers Sand and Gravel, Incorporated are acceptable. It is recommended that fine and coarse aggregate from the five above stated sources be listed in the project specifications as approved.



STATE: Mass.		INDEX NO.:		AGGREGATE DATA SHEET		TESTED BY: NED Testing Laboratory	
LAT: 42°N		LONG: 71°W				DATE: 10 February 1975	
LAB. SYMBOL NO.: 71-267-1 thru 4				TYPE OF MATERIAL: Natural Sand & Gravel			
LOCATION: Saxonville, Mass.							
PRODUCER: New England Sand & Gravel (Commercial)							
SAMPLED BY: R. J. Gauvreau NED.							
TESTED FOR: Saxonville Local Protection, Saxonville, Massachusetts							
USED AT:							
PROCESSING BEFORE TESTING: screened and washed							
GEOLOGICAL FORMATION AND AGE: Glacial kame terrace and outwash plain, Pleistocene age							

GRADING (CRD-G 103)(CUM. % PASSING):					TEST RESULTS								FINE AGG.
SIZE	1 1/2"	3/4"	3/8"			1 1/2"	3/4"	3/8"					
SIEVE	1 1/2"	3/4"	3/8"			BULK SP. GR, SAT SURF DRY (CRD-C 107,108):	2.71	2.66	2.66				2.67
6 IN.						Absorption, PER CENT (CRD-C 107,108):	0.83	1.05	1.35				1.32
5 IN.						ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):							1
4 IN.						SOFT PARTICLES, PER CENT (CRD-C 130):							
3 IN.						PER CENT LIGHTER THAN SP. GR. (CRD-C 129):							
2 1/2 IN.						PER CENT FLAT AND ELONGATED (CRD-C 119,120):	6.7	3.5	6.6				
2 IN.						WEIGHTED AV. % LOSS, 3 CYC. M <sub>80</sub> (CRD-C 113)	0.6	3.6	5.7				0.8
1 1/2 IN.	100					ABRASION LOSS (L. A.), % (CRD-C 117):	27.3	27.3	27.3				
1 IN.	76	100				UNIT WT., LB/CU FT (CRD-C 106):	100.7	98.7	101.1				111.3
3/4 IN.	13	98				CLAY LUMPS, % (CRD-C 118)							
3/8 IN.	2.1	60	100										
1/2 IN.	1.7	23	88		100	SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):							
NO. 4	1.5	2.7	23		96.5	REACTIVITY WITH NaOH (CRD-C 128):	Sc, mM/L:						
NO. 8	1.4	2.0	5.9		83.7		Rc, mM/L:						
NO. 16	1.3	1.7	3.1		68.6	MORTAR-MAKING PROPERTIES (CRD-C 116)							
NO. 30	1.2	1.5	1.9		47.1	TYPE: CEMENT, RATIO 7 DAYS, 100.4 %							
NO. 50	1.1	1.3	1.3		25.0	LINEAR THERMAL EXPANSION X10 <sup>-6</sup> DEG. F. (CRD-C 125,126):							
NO. 100	0.9	1.1	0.9		7.1								
NO. 200	0.6	0.8	0.6		1.7								
- 200 <sup>(a)</sup>													
F.M. (b)													

(a) CRD-C 105 (b) CRD-C 104		MORTAR:	
MORTAR - BAR EXPANSION AT 100F, % (CRD-C 123):			
LOW-ALK. CEMENT: % Na <sub>2</sub> O EQUIVALENT:			
HIGH-ALK. CEMENT: % Na <sub>2</sub> O EQUIVALENT:			
SOUNDNESS IN CONCRETE (CRD-C 40, 114):			
FINE AGG. N.E. Sand & Gravel		COARSE AGG. N.E. Sand & Gravel	
FINE AGG.		COARSE AGG.	

FINE AGGREGATE				COARSE AGGREGATE			
3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.

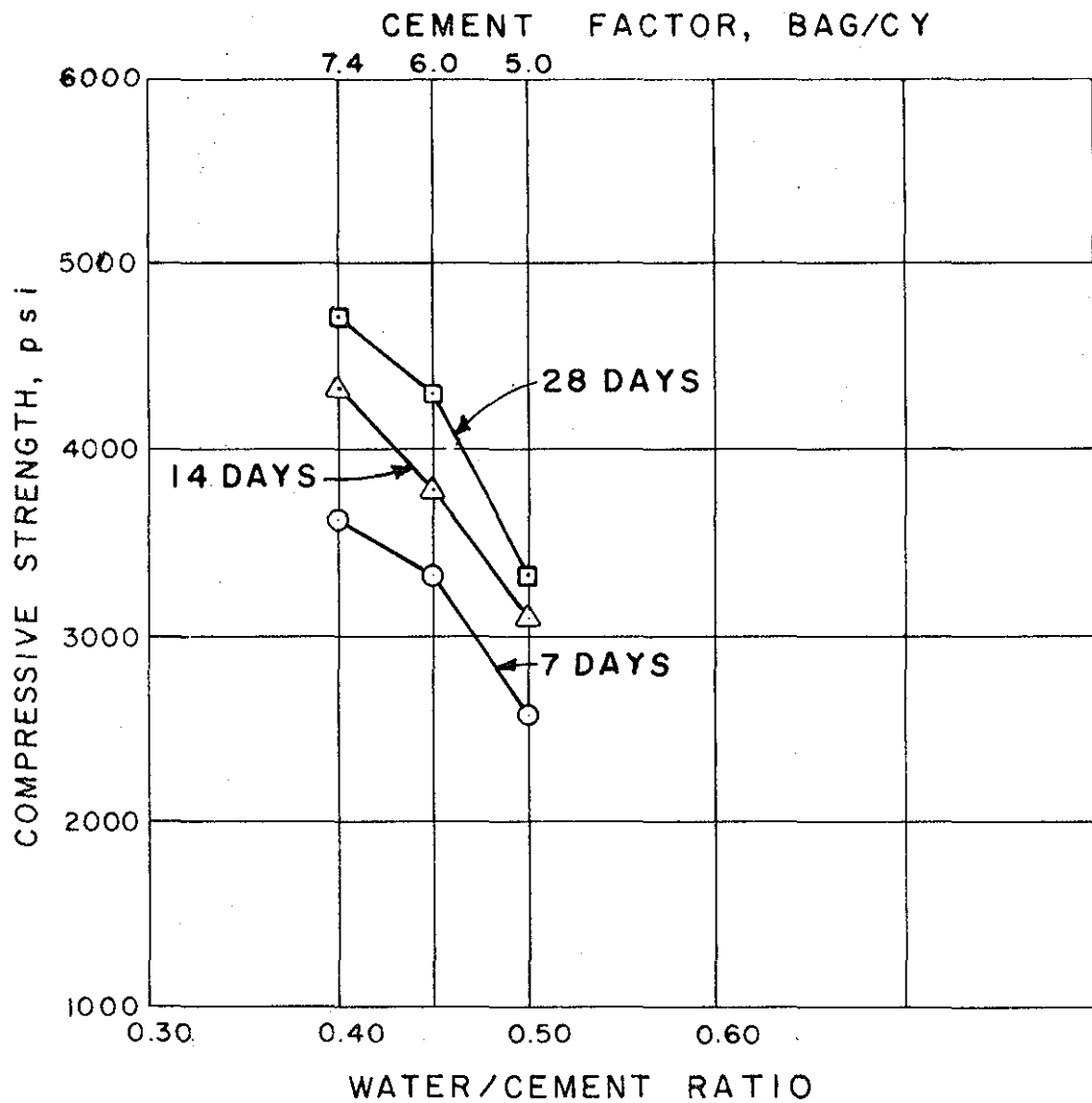
SOUNDNESS IN CONCRETE (CRD-C 40, 114):		F & T		HW - CD		HD - CW	
FINE AGG. N.E. Sand & Gravel		DFE <sub>300</sub>		77			
FINE AGG.		COARSE AGG.		DFE <sub>300</sub>			

PETROGRAPHIC DATA (CRD-C 127) Fine aggregate is predominantly quartz and subordinate amounts of granitic rock particles, hornblende gneiss, schist, feldspar, mica, and detrital heavy minerals. There are no apparent potentially deleterious reactive materials apt to react with alkalis of cement. FA is satisfactory for use as a concrete aggregate. Coarse aggregate predominantly granite, gneiss, and quartzite. Weathering ranges from slight to moderate on granites and gneiss. No apparent potentially deleterious reactive materials. In general, this gravel is dense and durable and satisfactory for use as concrete aggregate.

REMARKS:



FINE AND COARSE AGGREGATE  
NEW ENGLAND SAND AND GRAVEL COMPANY  
SAXONVILLE, MASSACHUSETTS

**NOTE:**

CONCRETE WITH 1 1/2"  
MAXIMUM SIZE COARSE  
AGGREGATE, 3 1/2" SLUMP  
5.5 % ENTRAINED AIR,  
TYPE II PORTLAND  
CEMENT.

WATER RESOURCES DEVELOPMENT PROJECT  
**MERRIMACK RIVER BASIN**  
SAXONVILLE LOCAL PROTECTION  
CONCRETE MAKING PROPERTIES  
SUDBURY RIVER                      MASSACHUSETTS



STATE: Mass.		INDEX NO.: 15 (rev.)		AGGREGATE		TESTED BY: SAD Testing Laboratory	
LAT.: 42° N		LONG.: 71° W		DATA SHEET		DATE: 18 April 1956	
LAB. SYMBOL NO.: 82/242 (FA) 243-245 (CA)						TYPE OF MATERIAL: Nat. Sand & Crushed Gravel	
LOCATION: Pit located in the N.E. Section of the Blackstone, Mass. & Rhode Island, U.S.G.S. quadrangle, Approx. 500 Ft. N.W. of the intersection of Route 140 &							
PRODUCER: Rosenfeld Sand & Gravel Co.						Hartford Ave., & Plain St.	
Hopedale, Mass. (Commercial)							
SAMPLED BY: J. A. McElroy							
TESTED FOR: Local Flood Control, Buffumville, Massachusetts							
USED AT: Flood Control, Woonsocket, R.I., (1957-9); West Hill Dam, Hopedale, MA (1959)							
PROCESSING BEFORE TESTING: Crushing and Sizing by producer							
GEOLOGICAL FORMATION AND AGE: Outwash Glacial Deposits, Pleistocene age.							

GRADING (CRD-C 103) (Cum. % Passing):						TEST RESULTS				Combined Sample																							
SIZE	3-6"	1 1/2" - 3"	3/4" - 1 1/2"	4" - 3/4"	FINE AGG.					3-6"	1 1/2" - 3"	3/4" - 1 1/2"	4-3/4"	FINE AGG.																			
SIEVE	3-6"	3"	1 1/2"	3/4"		BULK SP. GR., SAT SURF DRY (CRD-C 107, 108):						2.65		2.65																			
6 IN.						ABSORPTION, PER CENT (CRD-C 107, 108):						0.9		0.6																			
5 IN.						ORGANIC IMPURITIES, FIG. NO. (CRD-C 121):								1																			
4 IN.						SOFT PARTICLES, PER CENT (CRD-C 130):																											
3 IN.						PER CENT LIGHTER THAN SP. GR. (CRD-C 129):																											
2 1/2 IN.						PER CENT FLAT AND ELONGATED (CRD-C 119, 120):						4	5																				
2 IN.						WEIGHTED AV. % LOSS, 5 CYC. MgSO <sub>4</sub> (CRD-C 115):						3.8		8.5																			
1 1/2 IN.		100	100			ABRASION LOSS (L.A.), % (CRD-C 117): A Grading						42																					
1 IN.		71	98			UNIT WT., LB/CU FT (CRD-C 106):																											
3/4 IN.		17	72			CLAY LUMPS, % (CRD-C 118)								0.2																			
1/2 IN.		4	11	100																													
3/8 IN.		3	3	99	100	SPECIFIC HEAT, BTU/LB/DEG. F. (CRD-C 124):																											
NO. 4		1	1	8	98	REACTIVITY WITH NaOH (CRD-C 126): S <sub>c</sub> , mm/L:						14		10																			
NO. 8				2	82	R <sub>c</sub> , mm/L:						47		60																			
NO. 16					64	MORTAR-MAKING PROPERTIES (CRD-C 116)																											
NO. 30					44	TYPE: II CEMENT, RATIO: 28 DAYS, 115 % DAYS, %																											
NO. 50					23	LINEAR THERMAL EXPANSION X 10 <sup>-6</sup> DEG. F. (CRD-C 125, 126):																											
NO. 100					7	<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th>ROCK TYPE</th> <th>PARALLEL</th> <th>ACROSS</th> <th>ON</th> <th>AVERAGE</th> </tr> <tr> <td>Granite</td> <td></td> <td></td> <td></td> <td>4.8</td> </tr> <tr> <td>Gabbro</td> <td></td> <td></td> <td></td> <td>4.0</td> </tr> <tr> <td>Quartz</td> <td></td> <td></td> <td></td> <td>5.3</td> </tr> </table>								ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE	Granite				4.8	Gabbro				4.0	Quartz				5.3
ROCK TYPE	PARALLEL	ACROSS	ON	AVERAGE																													
Granite				4.8																													
Gabbro				4.0																													
Quartz				5.3																													
NO. 200						MORTAR: 5.3																											
- 200 <sup>(a)</sup>																																	
F.M. (b)																																	

(a) CRD-C 105 (b) CRD-C 104

MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):		FINE AGGREGATE				COARSE AGGREGATE			
	% Na <sub>2</sub> O EQUIVALENT:	3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.
LOW-ALK. CEMENT:									
HIGH-ALK. CEMENT:									

SOUNDNESS IN CONCRETE (CRD-C 40, 114):		F & T	HW-CD	HD-CW
FINE AGG. 82/242 Rosenfeld	COARSE AGG. 82/243-45 Rosenfeld	DFE <sub>300</sub>	67	
FINE AGG. S&G Co.	COARSE AGG. S&G Co.	DFE <sub>300</sub>		

PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is pinkish gray, rounded to angular, crushed gravel composed of about 78% granite and gneiss, 8% quartz and quartzite, 9% basalt and 5% miscellaneous rock types.

The fine aggregate is grayish-tan, subrounded to angular sand composed of about 62% quartz and quartzite, 24% granite and gneiss, and 14% miscellaneous material.

Soft, highly weathered particles comprise about 9% of the gravel and a small amount of the sand. The sand and gravel particles are generally of satisfactory shape. The gravel is coated with silty dust.

REMARKS: CRD-C125 Quartzite - 4.8 x 10<sup>-6</sup>/°F  
Sandstone - 6.4

STATE: Mass.		INDEX NO.: 14		AGGREGATE DATA SHEET		TESTED BY: SAD Testing Laboratory							
LAT.: 42° N.		LONG.: 71° W		DATE: 27 April 1956									
LAB. SYMBOL NO.: 82/238 (FA) 239-241 (CA)				TYPE OF MATERIAL: Nat. Sand & Crushed Gravel									
LOCATION: Pit is located in the NW section of the Franklin, Mass., U.S.G.S. quad-range about halfway between Rtes. 140 & 126 on the N. Side of Hartford Ave.													
PRODUCER: Varney Sand and Gravel Company, Bellingham, Mass. (Commercial)													
SAMPLED BY: J. A. McElroy													
TESTED FOR: Local Flood Control, Buffumville, Massachusetts													
USED AT													
PROCESSING BEFORE TESTING: Crushing and Sizing by Producer													
GEOLOGICAL FORMATION AND AGE: Outwash Glacial Deposits, Pleistocene Age.													
Combined Sample													
GRADING (CRD-G 103) (Cum. % Passing):				TEST RESULTS		3-6" 1 1/2" 3/4- 4- FINE							
SIZE	3-6"	1 1/2"	3/4-	4-	FINE AGG.	3"	1 1/2" 3/4" 3/4" AGG.						
6 IN.													
5 IN.													
4 IN.													
3 IN.													
2 1/2 IN.													
2 IN.													
1 1/2 IN.		100											
1 IN.		91											
3/4 IN.		58	100										
3/8 IN.		9	76										
1/4 IN.		2	34	100	100								
NO. 4			3	18	99								
NO. 8			2	4	91								
NO. 16					75								
NO. 30					51								
NO. 50					17								
NO. 100					3								
NO. 200													
- 200 (a)													
F.M. (b)													
(a) CRD-C 103 (b) CRD-C 104				MORTAR: 5.0									
MORTAR-BAR EXPANSION AT 100F, % (CRD-C 123):				FINE AGGREGATE				COARSE AGGREGATE					
				3 MO.	6 MO.	9 MO.	12 MO.	3 MO.	6 MO.	9 MO.	12 MO.		
LOW-ALK. CEMENT: % Na <sub>2</sub> O EQUIVALENT:													
HIGH-ALK. CEMENT: % Na <sub>2</sub> O EQUIVALENT:													
SOUNDNESS IN CONCRETE (CRD-C 40, 114):								F & T		HW-CD		MO-CW	
FINE AGG. 82/238 Varney S&G				COARSE AGG. 82/239-241 Varney S&G				69					
FINE AGG. CO				COARSE AGG. CO									
PETROGRAPHIC DATA (CRD-C 127): The coarse aggregate is gray, hard, rounded to angular crushed gravel composed of about 84% granite and gneiss, 5% quartz and quartzite, 8% basalt and related igneous rocks, and 3% miscellaneous rock types. The fine aggregate is gray to tan, subangular sand composed of about 70% quartz and quartzite, 19% granite and gneiss, and 11% miscellaneous material. Soft, badly weathered particles total 5% of the gravel and a small amount of the sand. Most of the sand and gravel particles are of satisfactory shape.													
REMARKS: CRD-125 Quartzite - 4.6x10 <sup>-6</sup> /°F Gabbro - 4.0 Hornblendite - 4.1													